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VOLUME XXXIV FEBRUARY, 1935 NUMBER 2

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Miss Svec is an instructor in the department of geography in the State Teachers College, Buffalo, New York and critic teacher in the Practice School. Another paper by her, A Method of Testing, appeared in the JOURNAL, October, 1933.

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When this paper was prepared Mr. Proudfoot was at the University of Chicago. He is now an assistant geographer in the Land Planning and Housing Division of the Tennessee Valley Authority.

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Dr. Rose B. Clark is head of the department of geography in Nebraska Wesleyan, a college in which geography has long been an essential part of the curriculum. Dr. Clark is author of Geography for the Grades, Unit Studies in Geography and the Nebraska supplement to the Human Geography series. Her latest publication, Geography in the Schools of Europe, is Part Two in the volume by Isaiah Bowman, Geography in Relation to the Social Sciences. This volume is the fifth in the series of reports of the Commission on the Social Studies.

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VOLUME XXXIV FEBRUARY, 1935 NUMBER 2

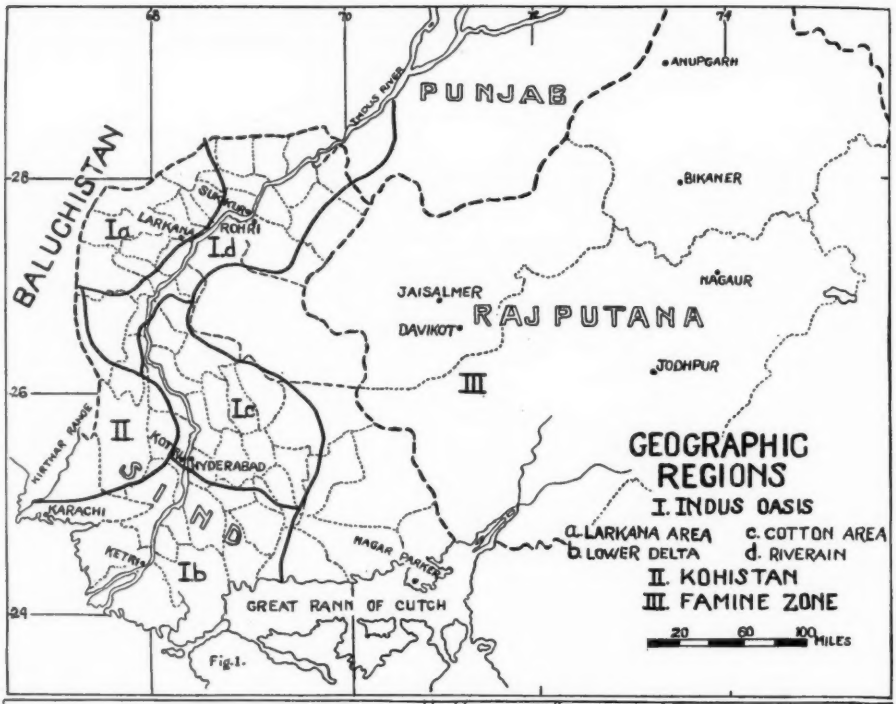
THE DRY LANDS OF SIND AND WESTERN RAJPUTANA IN NORTHWESTERN INDIA*

M. MELVINA SVEC
State Teachers College, Buffalo

The hottest and driest section of India where water regulates the rhythm of life lies in the provinces of Sind and Western Rajputana. Here desert and steppe features dominate the landscape. The monotonous relief of this low alluvial plain is broken occasionally by north-south trending limestone ridges and dunes. Along the eastern margin (Figs. 1 and 2) is a zone of variable rainfall of fifteen to twenty inches, which in spite of the high evaporation is sufficient to provide pasture and to produce certain summer crops without supplementary irrigation. The western margin is marked by the political boundary of Baluchistan. On the north the region merges into the desert portion of southern Punjab.

In this Indus Plain and Thar Desert extremes of summer heat contrast with winter chill. A seasonal range of 20°F. along the coast more than doubles at inland sites. Inland the intense insolation and the quiet air of summer force the thermometer to 100°F. or more where it remains thruout day and night unabated for weeks at a time. The Afghans say, "The sun of Scinde will turn a white man black and roast an egg." In April the "Challiho," strong indrafts of southerly winds, set in and continue for some forty days. In Lower Sind they are of more than ordinary violence and cause blinding dust storms. To facilitate travel over the sandy highways a straw cover is used as a surfacing in some places, while in other places the highways are obliterated, leaving only milestones as guides. Even the railways have to be dug out of the encroaching sand drifts. The ever present wind and mounting temperatures favor rapid evaporation which results in alkalization and crustiness of the soil. By late May the high temperatures and winds break

* From a paper presented in a graduate seminar on India at the University of Wisconsin.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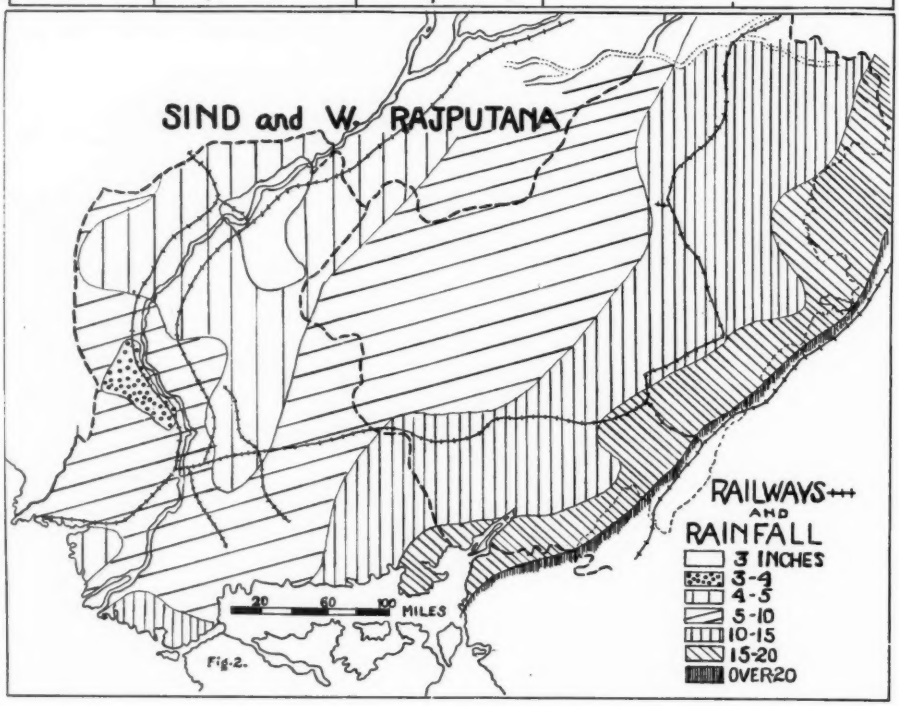
ROHRI
LARKANA
Ia
Id
Ic
II
III
Ib
KIRTHAR RANGE
HYDERABAD
KARACHI
KETRI
NAGAR PARKER
GREAT RANN OF CUTCH
GEOGRAPHIC REGIONS
I. INDUS OASIS
a. LARKANA AREA
b. LOWER DELTA
c. COTTON AREA
d. RIVERAIN
II. KOHISTAN
III. FAMINE ZONE
20 60 100 MILES
Fig.1.


SIND and W. RAJPUTANA
RAILWAYS
AND
RAINFALL
3 INCHES
3-4
4-5
5-10
10-15
15-20
OVER 20
20 60 100 MILES
Fig.2.

with the advent of the monsoon in peninsular India. The rainfall average varies from less than three inches in Upper Sind to more than seventeen along the eastern margins of this region. More than four-fifths of this precipitation falls between June and September. This is highly important in the lands east of the 70° meridian where less than 10 per cent of the cropped area is irrigated (Figs. 3 and 4). The lack of rain to the west of this meridian is not as serious as at first might appear, for here cultivation and irrigation are synonymous. More than 73 per cent of the gross cropped area of all Sind is watered by the canal systems of the Indus River.

Entering Sind, flowing in a southerly direction, crossing its entire length, a distance of some 500 miles, the Indus River well marks the Oasis, that band of green it has created and sustains. Here is concentrated the humanity and activity of this part of India, with a density of population averaging 100 to the square mile (Fig. 7). Clusters of villages with low flat roofs rise above green fields or stand out against brown fallow fields. Some of the more pretentious city dwellings may have "wind-catchers" to divert the breeze down an air shaft into the rooms. These devices resemble kites poised for flight. And true to human nature, each resident seeks to build his shaft higher than that of his neighbor! Narrow roads flank either side of the larger irrigation canals, thus taking advantage of the elevation. Along the borders of many of the ditches are clumps of trees which serve as wind breaks and delimit pasture and grazing patches with the ever present palm fronds reaching skyward to meet the sun. At the south, the river becomes a maze of tidal creeks piled high with water driven upstream in summer by the steady southwest monsoon. Only birds and crocodiles inhabit these parts in which such vegetation as tamarisk and mangrove flourish.

GEOGRAPHIC SUBDIVISIONS: I. THE OASIS

The Oasis, densely populated and intensively cultivated, depends entirely upon the vagrancies of the Indus. This great river, fed by the perennial snows of the Himalayas, rides in a capricious fashion over its alluvial plain of unknown depth on a ridge of its own making. Scars of abandoned channels rise like dikes across the land. Here and there ruins of deserted cities mark the numerous former courses. Some of these ditches are used for irrigation and for carrying off excess water in the flood season. Some are even overgrown with brush and jungle and used as grazing patches. The

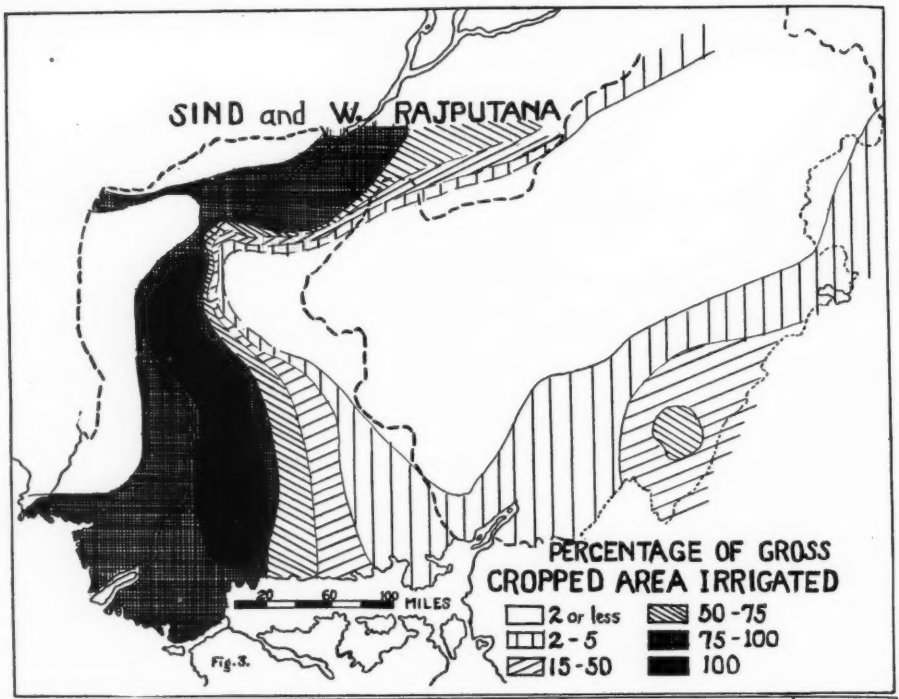

SIND and W. RAJPUTANA
PERCENTAGE OF GROSS
CROPPED AREA IRRIGATED
2 or less
2 - 5
15 - 50
50 - 75
75 - 100
100
20 60 100 MILES

Fig. 3.

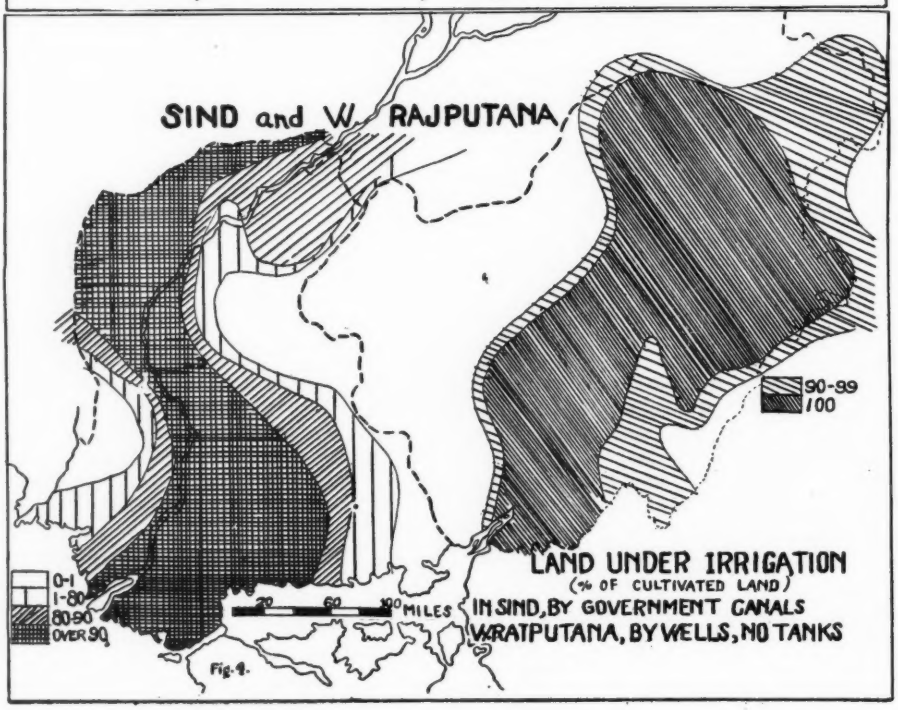

SIND and W. RAJPUTANA
90-99
100
LAND UNDER IRRIGATION
(% OF CULTIVATED LAND)
IN SIND, BY GOVERNMENT CANALS
W. RAJPUTANA, BY WELLS, NO TANKS
0-1
1-80
80-90
OVER 90
20 60 100 MILES

Fig. 4.

entire alluvial stretch adjacent to the Indus is threaded by a network of canals and river distributaries, some becoming lost in the sands and marshes, others circling back to the stream. Thruout the tract, waste and idle lands are interspersed among the irrigated portions, while desert and steppe flank the borders. The cultivated area of the Oasis occupies but 31 per cent of the total area of Sind, and only about one-half of that is sown annually for the remainder of the cultivable area lies fallow.[1]

Since the Oasis is completely dependent upon irrigation, famine and drought are not dreaded here as in those sub-humid parts of India relying upon the uncertain and variable monsoon. Rainfall is hardly wanted and, in fact, it is a nuisance when it comes in those infrequent deluges that occasionally descend upon deserts. Little or no provision is made for the runoff and the mud huts of the villagers collapse. The absolute dependence upon the river, however, carries with it an element of chance. It may rise late, subside prematurely, or fall intermediately. The irrigation level at the Kotri gauge registers seventeen feet at normal, varying from fifteen feet (1925) to more than twenty-four feet (1924). As for the period the level is maintained, the shortest on record is thirty-two days (1925), and the longest is eighty-six days (1924). There appears, then, to be some correlation of high water level and longer duration of inundation with the monsoon behavior.

The alluvial soils vary greatly in fertility. The better lands are the more recently deposited silts which extend for ten to twelve miles along either bank of the stream. The high temperatures and moisture favor the rapid weathering of soil particles and accumulation of kalar or salts. Some of the clay soils become so caked after drying a day or two that the hard surface resembles a pavement with cracks and fissures an inch or more in width separating the soil blocks. The lack of humus and the beneficial effects of a winter's rest common in a continental interior agricultural area are of course not possible here. The fertility is restored in some measure by fallowing, a practice so general, altho mainly due to the lack of water, that over 50 per cent of the cultivable land is so classed. The fields make such a vigorous restoration that the subsequent crops take on a vivid green color.

Canals provide water for some 95 per cent of the irrigated area (Fig. 4). There are two types of canals: the inundation and the

[1] Total area of Sind, 30,158,000 acres; total cultivated area, 9,497,000 acres; current fallows, 5,072,000 acres; area irrigated, 3,286,000 acres; net cropped area, 4,425,000 acres.

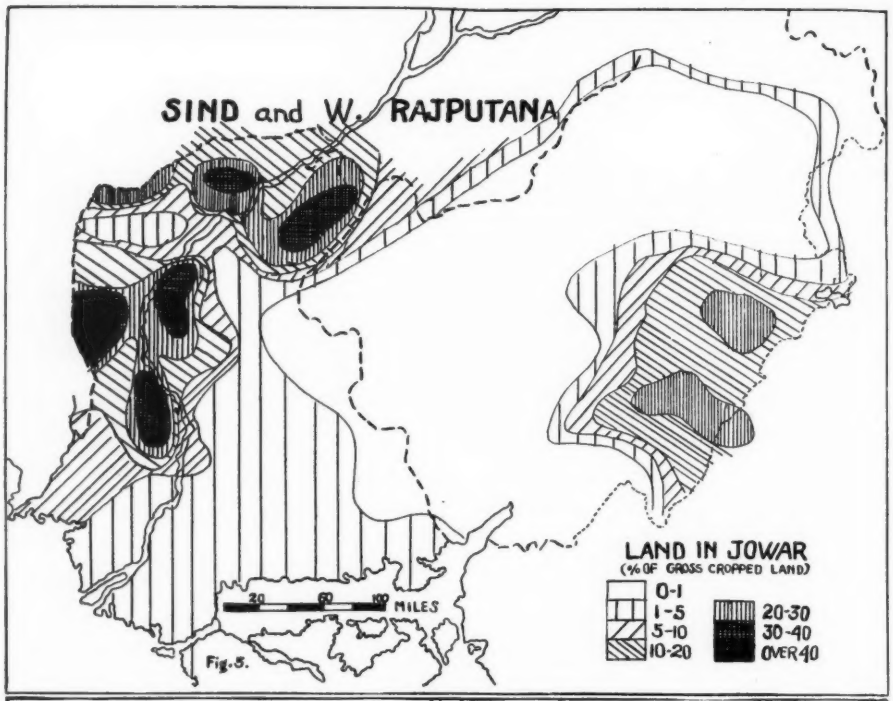

SIND and W. RAJPUTANA
LAND IN JOWAR
(% OF GROSS CROPPED LAND)
0-1
1-5
5-10
10-20
20-30
30-40
OVER 40
20 60 100 MILES

Fig. 5.

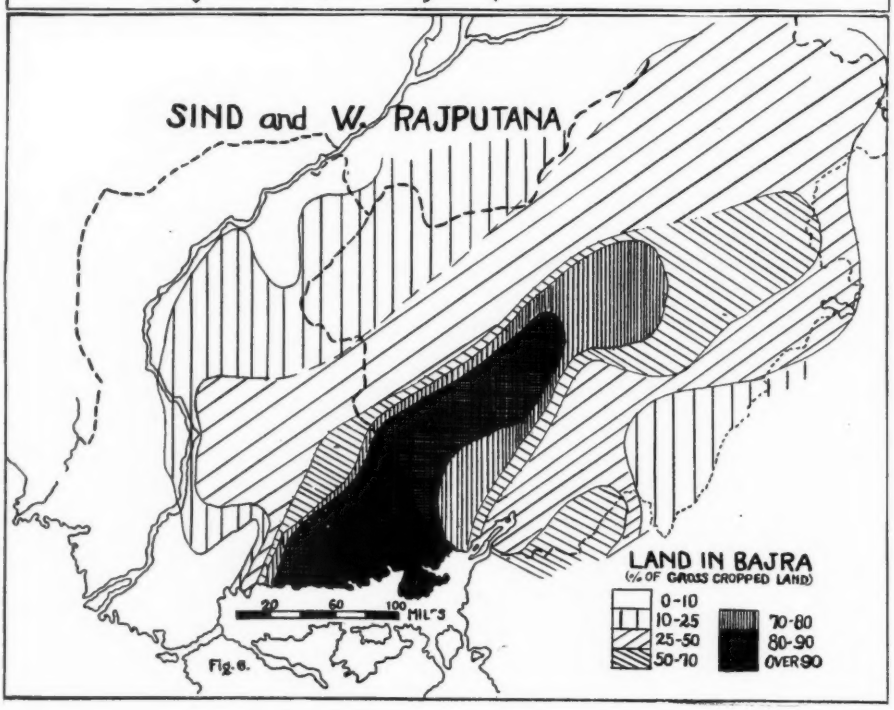

SIND and W. RAJPUTANA
LAND IN BAJRA
(% OF GROSS CROPPED LAND)
0-10
10-25
25-50
50-70
70-80
80-90
OVER 90
20 60 100 MILES

Fig. 6.

perennial. The former receive water only when the Indus is in flood; the latter are provided with an obstruction at their head to impound water. The first type is at present the most common, for the generally level land, less than 200 feet above sea level, is easily flooded from the elevated river. Old creeks and river channels carry the diverted water by gravity system onto the fields. For higher fields the use of the creeking wooden hurla (Persian water wheel), powered by camels or bullocks, precedes and supplements the natural flow. The fluctuating river may fail to meet the demands of the seeded area. In case of premature subsidence or unexpected late rise of the river, the crop may fail or the canal banks burst resulting in a partial or total crop loss. Mounds of soil from the silt choked diversion canal mouths give evidence of the clearance work performed usually at low water stage.

To mitigate the defects of the simple and uncertain inundation systems the Government has improved many of the canals so that they are to some extent of perennial character. Altho this assures a water supply, it is not an unmixed blessing. The surplus water needs to be drained, and water logging and alkaline formation need to be forestalled. In time and under certain conditions the raised water level should reduce irrigation requirements.

The most ambitious scheme undertaken in all India is the Sukkur Project or Lloyd Barrage, designed to command an area greater than that irrigated in Egypt. This Indus dam, officially opened January 13, 1932, is three miles below the rocky gorge at Sukkur and Rohri. The completion of this engineering feat together with the proposed expansion during the coming twenty years or more, will not only revolutionize the character of farming from the single money crop system to the mixed farming and increased fruit production, but also introduce certain economic and industrial problems. An estimate of the crop apportionment indicates to what extent the success of the Sukkur Project is based upon increased winter irrigation, limited to date by the lack of water rather than by seasonal temperatures.

Land Use	*Present*		*Future*	
kharif[2]	31%	38%	27%	81%
rabi[3]	7%		54%	
fallow	62%		19%	

[2] Kharif crops are summer grown and depend upon the summer monsoon and heavy irrigation such as, rice, cotton, jowar (a millet).

[3] Rabi crops are grown in the cooler season and require less moisture such as, wheat, barley, and the pulses (legumes).

The Oasis may be further subdivided into four units based upon crop associations and land utilization (Fig. 1). One exceptionally fertile tract, "The Garden of Sind," forty miles wide and sixty miles long borders the upper right or west bank. Here is the premier Larkana rice district. A second tract extends from the lower left or east bank to the Eastern Nara, delimiting the cotton area of Sind. At the extreme south in the flooded delta lands is a second rice district. Lastly, the Riverain, the immediate river lands of the middle and upper Sind tract are devoted to a combination of rabi and kharif crops, with more emphasis on the former system in contrast to the more general practice of summer cropping in the most of Sind.

The Rice Areas. The most popular and extensively grown crop in Sind is rice. Fifty-three of the fifty-nine talukas (political units) of Sind lie within the Oasis tract and all but two raise rice in varying amounts. This crop, normally produced in areas having more than fifty inches of rainfall, thrives here in less than ten inches of rainfall exclusively an irrigated crop. Rice is the dream crop of the zamindar (landowner), the safe profitable crop, and one practically free from pests and diseases. It has been limited by irrigation facilities and government restrictions, for fifty acres of rice use as much water as one hundred acres of cotton or millet, or two hundred acres of wheat.

I.a. The Larkana Rice District. This district, the premier paddy tract of Sind, is encompassed by the isopleth of 30 per cent of gross cropped area in rice, and by the 60 per cent isopleth in its most intensive center (Fig. 8). Here, the hottest and driest part of the Oasis, evaporation is so great that as much as a half inch of water is lost off the paddy field in a day. The crop is of high quality and shows a 600 per cent increase in production in the last forty years, amounting to over 50,000 tons in some years. To improve the keeping quality, the rice is put thru a boiling process called "josh." It is then sent via Karachi to Persia, Ceylon, and other Indian ports. The yields average 1500 pounds an acre with outturns of 3200 pounds rather common.

Altho some seed is sown broadcast in low lying tracts where the distance to ground water is less, the more general practice of transplanting results in higher yields. In the latter case, seed beds, a few feet square, are fertilized and flooded when the canals begin to flow. Men walk about with a piece of brush tapping the broad-

casted grains into the mud. In the two or three weeks before the plantlets are ready, the paddy fields are being ploughed, the hard clods broken with wooden mallets, and the fields smoothed with wooden rakes. The workers transplant the rice from early morning until the noon day heat, dibbling in six to twenty plantlets at a time. The field is then flooded with as much water as the bhunds or embankments, nine to fifteen inches high, will hold. Except for a weeding or two the cultivator has little to do beyond tending the flooding, repairing the bhunds, and keeping off stray animals. Rice

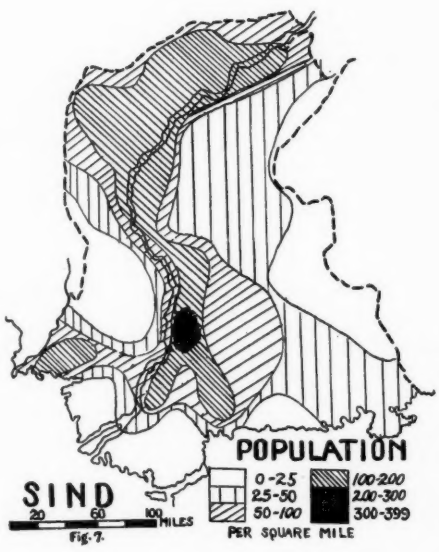


Fig. 7.

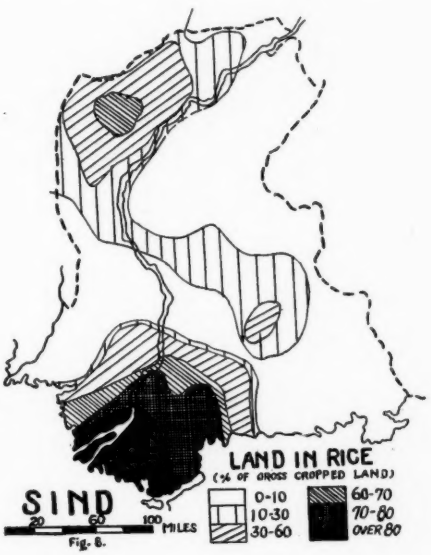


Fig. 8.

is called the lazy man's crop! If the bright green paddy takes on a rank growth, cattle graze off the tops. Other crops in the summer plan are jowar, cereals, fodder, and pulses with the usual fallow fields prominent.

In October the rice is harvested with sickles, left to dry a day or two in the field, and then stacked in the village yard. It is threshed by treading and winnowed by the wind. The surplus is prepared for export in the forty modern rice mills in and near the railway towns. Threshing activities are frequently delayed by the field work required by rabi planting. Wheat, lang, gram, rapeseed, and ratooned jowar occupy 35 per cent to 45 per cent of the area that had been in rice. Lang and gram are pulses or legumes and are used for human food and fodder. The two oilseeds, rapeseed and jambho, are used for fuel, food, and when mixed with ashes supply

a soap substitute. These winter crops are all off the field by the time the "canals arrive" in the spring.

I.b. The Delta Rice District. Rice may be grown here from choice but perhaps more so from necessity (Figs. 1 and 8). Conditions of humidity and soil are unfavorable for the cultivation of other grains in major quantities. Altho the area of this tract exceeds that of the Larkana District the small returns, averaging less than 1000 pounds an acre, reflect the inferior conditions of agriculture. The grain is consumed locally since it is a poor red quality that tolerates salt water. Two pests are common on the Delta: crabs and rats, the latter damaging 6 per cent to 12 per cent of the crop annually. Other khariff crops total but 2 per cent to 12 per cent of the cropped area. The sugar crop, high in reed and low in sugar, accounts for two-thirds of the production of all Sind and yet is far from sufficient to meet local requirements. The only maize raised is grown in the Karachi taluka. Bajra and local pulse crops (mug and udid) comprise the other kharif combinations. Since this is essentially a summer crop tract, the winter landscape presents less field activity, the rabi crops of barley, lang, and rapeseed totaling but 1 per cent to 16 per cent of the gross cropped area.

I.c. The Cotton Area of Sind. Midway between the two commercial rice tracts and on the east bank of the Indus, the major commercial crop is cotton (Fig. 9). The isopleth of 20 per cent of the gross cropped area in cotton encloses a region within which 95 per cent of the Sind fiber is raised. It is not so profitable a crop as rice but nevertheless it is the only other important commercial khariff crop. Like rice, cotton is sown when water is available, the unsteady flow of the river determining the time of planting and the returns obtained. If planted at the time of the early floods, the Challiho scorches the plantlets, and if planted late, the October frosts may injure the bolls. If the season "runs late," the canals not rising until the middle of July, then bajra replaces the cotton crop. A possible rotation is: first year, cotton, second year fallow, with bajra or wheat the third year, and a return to cotton the fourth year.

Cotton is not tolerant of sandy and kalar soils and requires fertilization. Earth mounds from deserted cities as well as manure are applied, usually at night, carried in containers by donkeys and camels. Silt and loess gathered from the river bank and from about the bushes are also used. When fields lie fallow, professional shep-

herds called "bakrars" herd flocks of sheep and goats over the patches.

Cotton occupies the land from February until late in the fall. Castor beans and hibiscus planted along the canal banks serve as wind breaks while grain crops and vegetables sown among the cotton plants and along the canal banks can be harvested before the cotton blossoms. Under sufficient irrigation some prolific types of cotton attain heights of eight feet, lodging under the weight of the foliage and bolls. Frequent pickings and night watchers reduce some of the possible losses. By late fall the animals are turned in

Fig. 9.

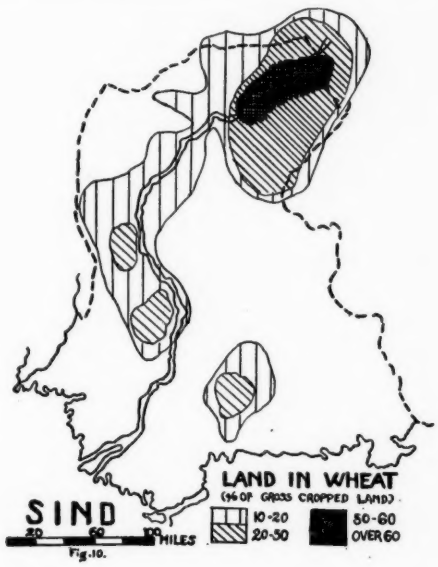


Fig. 10.

to graze off the brush, some of which is used by the cultivators for fuel and hut construction.

I.d. The Riverain Zone. The Riverain in Upper Sind seems to be a region of predominately rabi cropping, where wheat and jowar assume an importance nowhere equalled in the Oasis (Figs. 5 and 10). These grains grow in the cooler season and by middle spring the ripened grain is harvested with the same simple tools and by the same simple methods as is rice. The major summer crop, jowar, attaining heights of ten to twelve feet, matures in four months. The abundance of straw provides an excellent supply of fodder. The sweet stalk is commonly eaten like sugar cane. It is to be expected that the changes resulting from the Sukkur Project will alter flood conditions and consequently the cropping by reducing

the emphasis on fall and winter cultivation and increasing the summer activity.

POPULATION PATTERNS

As is true in India, Sind is rural. In the Larkana taluka 70 per cent of the population lives in villages adjoining the fields or in temporary huts near the hurla or located on the premises of the zamindar. The scanty shelters of mud, twigs, and brush lack the simplest comforts. Altho 83 per cent of the population is rural, Sind is by no means lacking in large city centers. Every District has a capital town and each taluka has a government town of several thousand inhabitants. The largest centers owe their location to strategic points along the early traveled routes. Visible for many miles over the flat plain at the north is the famous Landsdowne suspension bridge across the Indus. It made possible the completion of the "Outer Circle" railway route from Karachi to Lahore and Delhi via Sukkur. Scattered southward along the Indus and within a few miles of the main channel are the commercial centers of the Oasis. Caravans of camels and camel drawn wagons are still the common means of carrying surpluses to market and to the railway stations. Hyderabad, the old capital at the head of the delta, is the focal point for traffic crossing to the east bank of the "Inner Circle" route. No large towns are found on the low swampy deltaic portion or at the mouths of the Indus. Mud walls prevent the inundation of Ketri, a town of 3000 and second port of Sind. River barges bring down grain, wool, and cotton which is shipped to ocean going vessels. On the coast are low tidal flats, shallow shifting distributaries and seaward blown sand hills. Treacherous shoals keep vessels far out to sea, but fishing is good. One city, Karachi, deserves recognition.

In 1843 Karachi was a squalid fishing village of less than 15,000 but today a city of more than 260,000, the rival of Bombay, the envy of all ports of Western India, and the fourth ranking port of the Empire. Favored by its location on the air route to Europe and Egypt and on the water route via the Suez, Karachi, lying at the extreme western margin of the province, is the outlet for the vast surplus of the irrigated crops of the upper Indus and the inlet for imported goods. The chief commercial activity is in grain. Consequently, the volume of trade and the prosperity of the port vary in proportion to the seasonal fluctuations of crops in Sind and the Punjab which are its natural hinterland.

The harbor has been improved and facilities for servicing ships are at hand. The salubrious climate reduces the expense of warehousing. Bags of grain lie in the open for no storage elevators are needed. Camels still draw carts and wagons thru the city streets and trek out across the desert. The major items of export are wool, hides, skins, and grain. The incoming vessels bring cotton goods, hardware, sugar, machinery, and oil to be distributed the entire length of the Indus Valley.

II. The Hills and Plateaus of Kohistan

A fluctuating nomadic population inhabits the rugged hills that spill over the western frontier from Baluchistan (Fig. 1). Famine and consequent migration have reduced the numbers by half since 1911 and there are less than 10,000 people in this area now. A few scattered spots of cultivation depend upon hill torrents while others rely upon the uncertain and variable rainfall to produce jowar and wheat. Small stone huts mark the hamlets of the semi-nomadic graziers whose sheep, goats, and camels find fairly good pasturage after a rain. An important dairy industry is located in the southwestern hill area some thirty to forty miles from Karachi. Milk is taken daily, sometimes twice daily, to town by camels. On the return trip the load consists of rice, bran, cottonseed, and grain husks for neither feed nor fodder is grown for the many scattered small herds of five or six cows which form the wealth of their owners.

III. The Famine Zone

The Famine Region is surrounded by lands of sufficient surface water (Figs. 1 and 2). To the west is the Oasis, to the north the irrigated lands of the Punjab, and to the east the rainfall exceeds 20 inches and crops are possible. Unfortunately the larger part of this area, the Thar-Indian Desert and Steppe, some 600 miles long and 300 miles broad, is beyond the reach of any permanent streams. River channels are but rain gutters after a thundershower with an interrupted and intermittent flow the rest of the time. The steady winds have piled up processions of sand dunes usually 50 to 100 feet, some even attaining heights of 250 to 400 feet, and from less than a mile to more than two miles in length. In the depressions between these hills grow clumps of sear grey bushes and tufts of shrub typical of desert vegetation. Oases in this almost continuous sandy waste are strikingly lacking in the greenery of palms and orchards usually associated with desert oases in other regions be-

cause there are no sparkling springs or surface streams here. Water is laboriously drawn from wells at depths of 200 to 300 feet, which prohibits extensive irrigation as a lift of 75 feet is considered the maximum that can be worked with profit. Most of the vegetation is utterly dependent upon the meagre and irregular rains whose variability is well illustrated by the following stations:

	Average	*1926*
Nagar Parker	14.57	33.60
Davikot	6.59	13.60
Nagaur	17.25	34.17
Anupgarh	7.41	14.92

The Famine Area is enclosed by the isopleth of 15 per cent of the gross cropped area under irigation (Figs. 3 and 4). Equally significant is the isopleth of 1 per cent of gross cropped area in rabi crops which coincides with the forementioned isopleth. Two conclusions suggest themselves: (1) the rainfall element is very critical since there is so little irrigation, and (2) the kharif crops take advantage of the summer rains.

With the exception of the southeastern part of Sind, the cultivated areas are small and scattered. After the light spring rains the ground is scratched with a poor wooden plow drawn by camels and the grain then broadcasted. When sprouted, rather careful attention is given to weeding. Thorn fences serve to keep out wandering livestock. Scarecrows are set up and watchers frighten away birds with slings and noisemakers. The crops are now at the mercy of the southwest monsoon which will determine the abundance, more frequently the scarcity, of food for both man and beast. The meagerness of the rainfall is well stated in a proverb which says that one horn of a cow may be within the rainy area and the other without. The periodic droughts are aggravated by occasional locust plagues and hailstorms. In times of great scarcity the pods, leaves, and twigs of bushes are eaten by the people as well as by the stock.

Bajra is the staple kharif crop (Fig. 6). Other cereals and grains as well as vegetables are grown. Winter season crops of barley and wheat are planted on small well irrigated patches or on recently dried marshy tracts, some of which cover 400 acres; others occupy as much as 40 and 50 square miles in the rainy season but become dry in the winter and at this time they are cultivated. Here ground water occurs at eight to twenty feet.

Drought and famine, the "grand natural diseases" of the desert of Western Rajputana, occur locally once in two or three years

and rather generally thruout the state in eight to ten years. If the rains fail at one time or another, there is a grain or fodder famine, or both. If the rains fail thruout the year, there is a triple famine of grain, fodder, and water. When triple famines occur, 50 per cent to 75 per cent of the livestock may be lost, for only the fit survive. As food and pasture shortage become imminent, many nomads with their flocks migrate into Sind and Punjab where irrigation provides work and food. Seldom if ever do all the people return and certainly not all of their sheep, cattle, and goats. The following table reflects the result of famine and migration in the largest native state of Western Rajputana, the Marwar (Jodhpur).

	1919–1920	*1920–1921*
Sheep	2,060,441	418,667
Goats	1,509,489	290,557
Oxen	1,441,049	175,861
Buffalo	175,496	124,470
Camels	66,655	7,541
Horses and Mules	57,362	8,210

Good grazing lands are more common than generally supposed but the extreme variability of the rainfall limits the green cover to irregular times and places. As for the people, their suffering is increased by the spasmodic plagues of cholera, malaria and the excessive changes of temperature from day to night. Their distress is increased by the decrease in their flocks which are the main source of income as well as for food, shelter, and clothing.

Occasionally rock hills of varying color and resistance rise several hundred feet above the sandy wastes. These are natural defense sites for the desert towns which are enclosed by massive walls crowned with lofty turrets and massive parapets. A fort on the heights above commands a view of the entire city and the vast open plains stretching to meet the horizon. Ruins of temples, monasteries, and palaces in the older parts of the town indicate a former prosperity and larger population. The typical walled town has its several gates facing the other desert towns beyond the skyline. Even now the cities are the only centers of permanent settlement. In Jodhpur 75 per cent of the people live within town walls. Jaisalmer, devoid of greenery and 100 miles from the railway in the dead heart of the Thar, is still reached by caravans. The flat roofed houses are built of yellow limestone obtained from the nearby hills which form a hard stony plain of forty miles in circumference.

Bickaner, more fortunate in its communication, lies on the railway from Jodhpur to Lahore and Delhi. There are no trees, for this is not an oasis in the ordinary sense. Fifty wells with a lift of 300 feet supply the town with water. By means of heavy leathern buckets seventy to eighty pounds of water are drawn to the surface by bullocks treading an inclined plane. In such aridity nothing rusts. Chains, armor, and swords, all over 2000 years old, have not a fleck of rust! The buildings are of red sandstone which is obtained from the rock hills. Tradition tells that Bickaner owes its settlement to a group of merchants from the West Coast who were so persecuted that they fled into the desert. Bickaner is still the refuge for the trader and traveler crossing the Thar.

Since water and vegetation are more abundant along the eastern and southern margins, the towns are more numerous in these parts and serve as focal points for the flow of trade and travel. The weaving of silk and cotton goods, the making of rugs and blankets are industries common in every settlement. This obviously reflects the nature of the raw materials available and the necessity of producing articles of sufficient value and of such a character as to warrant long distance and expensive transportation. Brass work, lacquer ware, and rock candy suggest a few of the objects manufactured for local trade. The larger towns are fairly modern for some have street cars and paved streets. One railroad, the Jodhpur-Bickaner, makes a right angle along the southern and eastern margins, avoiding the more deserted western quadrant.

THE USE OF PHOTOGRAPHS IN TEACHING GEOGRAPHY AT FOUR PRIMARY LEVELS

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The basic utility of photographic material in teaching elementary geography was given in a previous article.[1] This constitutes the necessary background for a brief consideration of the choice and use of photographs at four primary school levels.

It is generally accepted that children are ready to begin the study of geography after completing three years of school work. Ideally, this course of study should continue for the next four years, and consist of four levels of geographic understanding.

USE OF PHOTOGRAPHS AT THE FIRST LEVEL

The first level of geographic understanding may be most profitably concerned with teaching a fundamental world concept of why the changing adjustments made by men to their sun-conditioned[2] natural environment depends on their location with regard to the equator. It is advisable for the work to begin in the Congo or Amazon basins, to illustrate the effect of the equatorial verticality of the sun's rays. From such a starting point, the following succession of areas might be studied: The Nile Valley; Italy or Switzerland; the Netherlands; southern Scandinavia; and Spitzbergen or Greenland. This may be followed by a study of the Pampas of Argentina or the wheat lands of Australia, and conditions in Antarctica, to illustrate similar solar effect at opposite seasons in the southern hemisphere.

[1] THE JOURNAL OF GEOGRAPHY, XXXI (December, 1932), p. 381-90.

[2] The heat produced by the rays of the sun as they strike the earth, directly affect the air and surface temperatures, and indirectly the amount of rainfall. These three important elements of the natural environment in turn affect all known forms of life. The rays of the sun that strike the earth are all essentially parallel to each other, but the earth is a sphere with a constant polar-axis tilt of 66½° from the plane of its 365¼ day orbit around the sun. These conditions produce the following results: (1) within the tropics the rays of the sun for a part of each day strike the earth almost vertically and produce a year around warm to hot season; (2) within the temperate zones they approach verticality for a part of the year and produce a warm season, whereas a part of the year they are quite oblique, resulting in a cold season; and (3) within the polar zones for a part of the year they do not strike the surface at all, resulting by their absence in an extremely cold season, whereas a part of the year they are quite oblique, resulting in a warmer season. Thus men in their gainful or recreational activities, make changing adjustments to their sun-conditioned natural environment, depending on their location with regard to the equator.

FIG. 1. This native hut in Jamaica represents a typical human adjustment to an alternately rainy and dry tropical environment. This photograph could be used as an integral part in a problem presentation method at the first level, to raise or answer questions relative to the adjustments made by men to the sun-conditioned natural environment of this latitude.

Several textbooks give abundant examples of the choice of photographs to help clarify the concepts of human adjustment to the natural environments of regions selected for the above fundamental purpose. Here it is only possible to state the various types of photographs found useful in this first level of geographic understanding.

Photographs should be selected to fit a balanced problem presentation method, stressing the important "cultural-natural-adjustment-complexes" of the regions chosen. Photographs so used in the first level, fall into the following classes: (1) those pertaining to why the changing adjustments made by men to their sun-conditioned natural environment depends on their location with regard to the equator, as shown by Figure 1; (2) those raising or answering questions about human activity in the natural setting, or those

showing the relation between two or more cultural or two or more natural factors as might be illustrated by food, clothing and shelter work pictures or those of recreational activity, or pictures showing the means of distribution, transportation, communication, and the work directly connected therewith; (3) those of regional setting and transition from region to region; and (4) those introducing maps and globes or illustrating them.

USE OF PHOTOGRAPHS AT THE SECOND LEVEL

The second level of geographic understanding should be concerned with teaching the student concepts of the geographic personalities of simple intra-political or political work regions.[3] This is accomplished by gaining an understanding of the important cul-

[3] A work region is an area within which one or several outstanding types of human work are being performed. The nature of this human activity distinguishes a given work region from another in which the activity or activities are quite dissimilar. Within the United States there are a number of work regions, but they are all within the political boundaries of the nation. Hence they may be defined as intra-political work regions. The human activity of a small country such as Uruguay is so similar thruout, that it may be defined as a political work region.

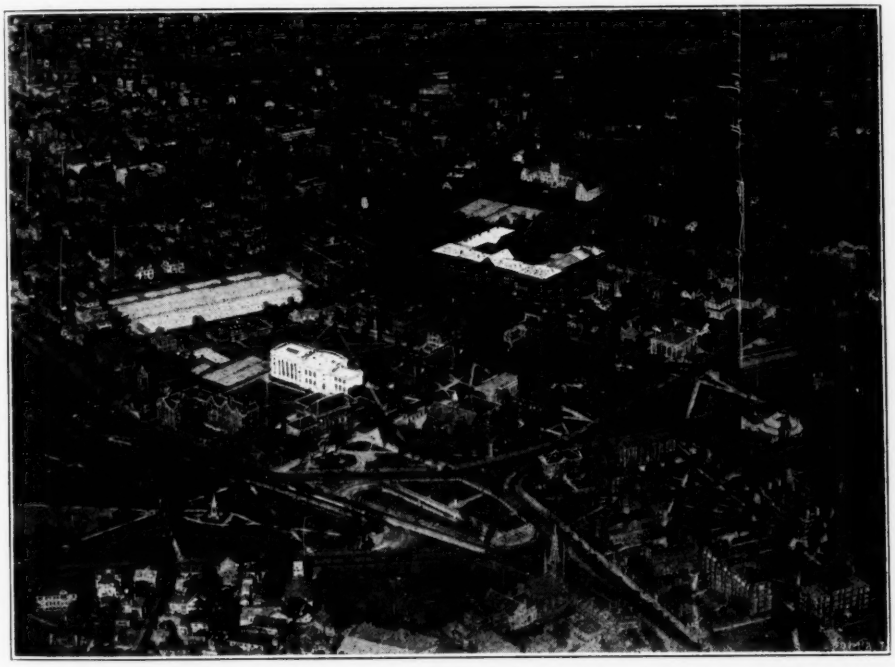

FIG. 2. Cambridge, Massachusetts, showing a densely populated area. This photograph could be used as an integral part in a problem presentation method at the second level, to provoke or answer questions relative to the density of population in this region.

tural features of the landscape, directly or indirectly related to the natural environment of these regions. Since the world concept of the importance of location with regard to the equator has been established, the teaching stress at this level may well be on the United States, its outlying possessions, and Canada. Here intra-political and political work regions may be studied. The first concepts of the interdependence of intra-political work regions should be established, and the various modes of transport serving the flow of commodity production should be made clear. This necessitates showing the distributional character of human activities in various regions and establishing their geographic personalities. It is this stress of the distributional aspects of population, type occupations, and their interdependence manifested by transportational interrelation, as related to the natural environment, which is the primary purpose of work at this level.

The photographs used here include all four classes employed at the first level, with the following additions: (1) those that provoke and answer questions relative to the distribution of people and their work in a given region; and (2) those that provoke or answer questions relative to the density of population in a given region, as illustrated by Figure 2.

USE OF PHOTOGRAPHS AT THE THIRD LEVEL

The third level of geographic understandings should be concerned with teaching the student an appreciation of the geographic personalities of more complex intra-political or political work regions. Photographs should be selected to show the important cultural-natural-adjustment features of the landscape, and thereby provoke or answer questions regarding the probable relationships existing between the cultural features and the natural features of specific regional environments.

As the regions treated at this level should be more complex, so the photographs used must form in part the basis for more complex concepts. The understandings introduced in level two, relative to the distribution of people and their work and the density of the population in a given region, should be used to intensify the thoroness of student understanding. In addition, a new class of concepts should be introduced here. Concepts concerning abstract human characteristics, such as: the standard of living in the various regions studied; or such national traits as patriotism, militarism, respect for old age and family tradition, industriousness, hardihood,

and honesty in business dealings. Such understandings should be the outgrowth of an intensive study of more complex intra-political or political work regions in Europe and Asia. In this case it is essential to remind the teacher that such concepts should only be used in geographic presentation if they are readily relatable to the adjustments made by people to their natural environment.

Again, the way in which photographic material may be made to function as an integral part of the problem presentation method at this level of geographic understanding is most effectively exempli-

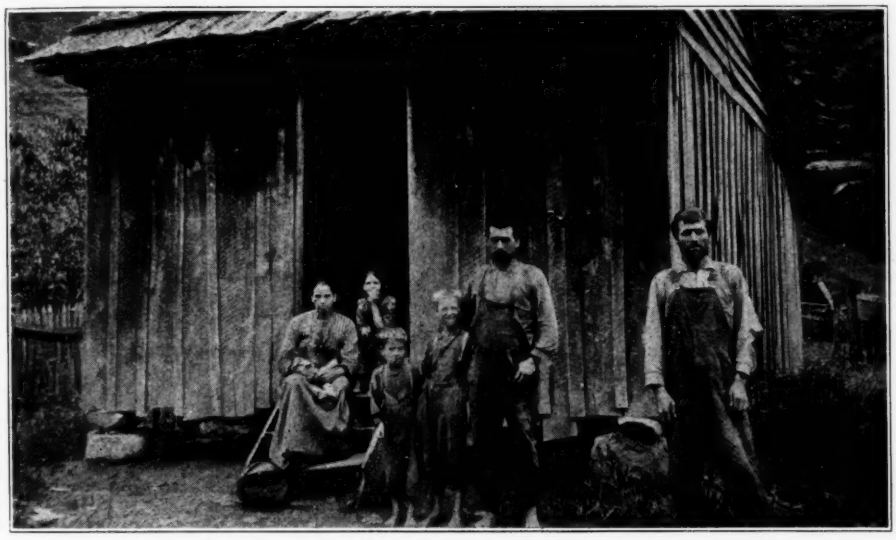

FIG. 3. A mountaineer family and their dwelling, located in an isolated section of Kentucky. This photograph could be used as an integral part in a problem presentation method at the third level, to provoke or answer questions relative to the standard of living in this region.

fied by several textbooks conceived on this basis. These should be studied for detailed examples of the types of photographs used.

Two changes are to be noted in the types of photographs used at this level. Those chosen to raise or answer questions relative to the seasons and location with regard to the equator are omitted; and those relative to an understanding of the above mentioned abstract characteristics have been added. The former type of photographic presentation was stressed in level one, its use was continued and firmly established in level two, and its omission in level three is a logical result. A good example of the latter type of photograph is illustrated by Figure 3.

USE OF PHOTOGRAPHS AT LEVEL FOUR

The fourth level of geographic understanding should be concerned with teaching the student an appreciation of the geographic personalities of fully complex intra-political and political work regions, and studying some of their external, but not world, relationships. Again, this is to be accomplished by showing the important cultural features of the landscape, directly or indirectly related to the natural environment of these regions. Photographs should be selected to raise or answer questions concerning the important cultural features of the landscape, and thereby provoke a series of questions regarding the relationships existing between these and the natural features of specific regional environments.

The regions to be chosen at this level should cover the remainder of the world. As these are to be taught with increasing thoroness, the photographs used must form intregal parts in a problem presentation method having for its goal a quite complete student understanding of all major geographic concepts of regional relationship. The new ideology introduced, is concerned with a study of the individual external trade of national units. This is accomplished by correlating the surplus products of nations with their exports, and their deficiencies with their imports. Since these concepts are most effectively taught by simple bar grafs, the use of photographs at this level is simply to further intensify the concepts established in levels two and three. The types of photographs used are identical to those listed for level three, but the conceptual intensity and complexity of their use should be increased commensurate to this higher level of geographic understanding.

CONCLUSIONS

Photographs may be used as an integral part in the problem presentation method of teaching geography at four primary levels. In this connection the most important of their many functions is to provoke or answer questions concerning the major cultural-natural relationship understandings as introduced at each level. Photographs used in this manner are of the following types: (1) at the first level, those helping to show why the changing adjustments made by men to their sun-conditioned natural environment depends on their location with regard to the equator; (2) at the second level, those pertaining to human activities, the distribution and density of population, and interdependence in simple intra-political and

political work regions; (3) at the third level, those pertaining to such abstract human characteristics as standard of living, patriotism, militarism, respect for old age and family tradition, industriousness, etc., in more complex intra-political and political work regions; and (4) at the fourth level, those relative to a thoro student understanding of all major geographic concepts of relationship in political work regions, stressing some external, but no world, relationships.

GEOGRAPHY IN THE SCHOOLS OF EUROPE*

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The countries selected for this study are France, Germany, Great Britain, Switzerland, Sweden, The Netherlands, Poland, Italy, and Czechoslovakia, a selection which includes large and small states, and also civilizations related to and very different from our own. The materials considered in the investigation include syllabuses, textbooks, manuals, educational and geographical periodicals, publications dealing with geographical education, as well as more general treatises upon the educational systems of the various countries.

Attempt has been made to discover what place the subject holds in the curricula of the elementary, intermediate, and secondary schools of each country, the objectives of instruction, the plan of teaching, the content covered at the different grade levels, the equipment handled, and the training of the teacher.

THE PLACE OF GEOGRAPHY IN THE CURRICULUM

The significance which educators attach to any subject may be indicated in part by the number of class periods they assign to it. In practically all European schools, geography is an essential part of the curriculum from the beginning to the end of school life.

In France, it is obligatory in all grades above the first. The French child studies geography for at least one hour a week from

* Abstract of a paper presented at the meeting of the National Council of Geography Teachers, Evanston, Illinois, December, 1933. For a full discussion of the subject—see, Geography in Relation to the Social Sciences, Part V, Report of the Commission on the Social Studies. Scribners, N.Y., 1934. Editor

the time he is seven until the end of the elementary school, in his thirteenth year. If he enters the advanced elementary school by competitive examinations, his curriculum includes geography thruout the course of three to five years. If he is able to attend a secondary school he will continue the subject for one to three hours a week until he leaves school, in his eighteenth year.

In Germany the child is given instruction in Heimatkunde for the first three years of his school life. Geography as a formal study begins in the fourth year and is obligatory thruout the remaining four years of the Volkschule. The subject is also obligatory thruout the entire course of the Mittelschule (a six year course) as well as in all years of the secondary schools, whatever their type, for one or two hours a week.

In England and Wales, there is little uniformity in courses of study or in requirements. However, common practice allots two or three hours a week to geography instruction thruout the elementary school, and in the intermediate and secondary schools up to the "first examination" at age 16. The Board of Education recommends three periods a week in geography and two periods in history for the secondary school curriculum. Heaton, in the *Journal of Education,* London (August 1930), shows the remarkable change of the status of geography in recent years. In 1894, he says, there was no examination in geography for matriculation to the University of London. In 1929, sixty-six per cent of the candidates took geography in the school certificate examinations. In Scotland geography is compulsory in the elementary school (ages 7 to 14) and for the first three years in the secondary school (ages 12 to 17).

In Switzerland, where each canton is autonomous in matters of public education, geography is taught for one or two hours a week thruout the elementary school (ages 6 or 7 to 14 or 15); in most cantons it is required for two hours a week in all years of the secondary school except the last. In the Netherlands there is no school year without geography from the third grade to the end of the secondary school. In Czechoslovakia and in Poland geography is required in all but one year of the secondary school; during that year in Polish schools, geology and mineralogy are substituted.

A comparison of the number of class periods devoted to geography instruction in the different lands shows that in practically all countries geography is offered for one, two, or three hours a week beginning with the third school year, and extending thru or up to the last year of the secondary period. Altho the subject ranks be-

low the mother tongue, foreign languages, and mathematics, it receives nearly the same time allotment as history, and is regarded as a "core" subject in most schools on the continent and in England.

THE DECLARED OBJECTIVES OF GEOGRAPHICAL INSTRUCTION

To understand the objectives of teaching in any system of schools one must bear in mind that the things outside the school have much to do in guiding and interpreting the things inside. In particular, the aims and purposes of teaching a given subject may be rooted deeply in the conditions of the national life itself. They are not "detached details" but are an inseparable part of the whole. This seems to be especially true of geography and history. Thru them the youth of a country are to be indoctrinated in ideas of nationalism or internationalism, capitalism or communism, or whatever theory is favored by the leaders of the state. In states where security or political integration is of first moment, this objective tends to become a narrow nationalism. In nations with stable political foundations and with an economic life that is to a considerable extent dependent on world trade, geography is the medium of teaching the interdependence of nations and the need for mutual understanding.

THE PLAN OF TEACHING

Most European instructors seem to consider teaching as an art which is acquired chiefly by clear understanding of their own and related fields of knowledge. According to their philosophy, the burden of responsibility for organization and exposition is placed on the teacher and the map, not on the textbook. Geography is seldom taught by the "textbook method." The European instructor employs the textbook as supplementary only, and uses material which is beyond that of the best textbooks in his pupils' hands. Out of this, he organizes a presentation which he thinks is adapted to the class.

European educators have devoted less attention to developing a science of teaching, than have Americans. Geography instructors apparently place slight stress on objective testing, experimental investigations, or attempts to set up standards of evaluation of materials and methods. Their first concern is to assemble the data of their science, analyze it subjectively, and organize it for teaching. That they succeeded in arousing a keen interest in the subject is apparent from the results of their instruction.

FRANCE

In the elementary schools of France, geography is taught in the ordinary classrooms; in the secondary schools, special rooms are usually equipped for it. Exposition by the teacher, with reproduction by the pupil, is the general method of school instruction. The first half of the class period is usually devoted to oral review; one pupil after another is called upon to give a logical and succinct account of any phase of the subject which the teacher selects. If he is obscure in explanation, or vague as to his information, or careless and illogical in his language, he is followed up until his discussion is satisfactory.

The teacher then "tells the story" of the new lesson to the pupils. During this time, the children follow the thought of the teacher with remarkable concentration. They seem to be capable of sustained effort, whether the matter is in itself absorbingly interesting or not. At the end of the exposition, the teacher may dictate a summary of the salient features he has discussed, which the pupils write in neat notebooks. A notebook is held thruout the entire secondary course, as a sample of the pupil's work. In preparation for the geography lesson, the pupil makes use of his notebook, an atlas (which all above the lower course must have), and possibly a textbook. Maps are used freely, but not given first place, as in Germany.

GERMANY

The teaching of geography in German schools has long been a matter of interest and admiration to foreign observers. They comment on the variety and thoroness which mark instruction in the subject; on the precise and effective presentation, on the skill in reviewing, on the basis laid for geographical thinking by the observation and interpretation of local, concrete things which surround the child in his home community; on the universal use of maps and atlases; and on the custom of employing school journeys as a means of education.

For more than half a century Germany has had the advantage of trained teachers of geography, and of good maps and atlases, and it has had in most of its states, a continuity in the geography curriculum which has helped to secure for its students a background of mastered ideas.

In the Prussian secondary schools, where the course deals broadly with the various parts of the world, there is great free-

dom in choice of materials, altho the yearly objectives to be attained are compulsory. Being a "core subject," geography must work in close sympathy with the other core subjects (religion, German, history, civics, science). As in the lower schools, the local community study is to provide an introduction to basal geography concepts and to understanding of the map.

Ten full days a year are now used for school journeys in the secondary schools, these excursions forming an important part of the German program of instruction. "Classes in German schools, during the spring, summer, and autumn months, are out of doors very frequently. Boats full of children with their teachers, ply up and down the Rhine and a dozen other rivers. There is scarcely a train that does not carry at least one group of traveling pupils. Footpaths along the canals and thru the forests are beaten hard by the feet of many 'wandering classes.' One finds them in the village market place, before the town hall, outside a cathedral. Hundreds and hundreds of children leave the schoolroom behind for a day or week and set out on a quest for adventure in their own land." A school principal at Hamburg explains to a visitor, "I am sorry but three of our classes are away today. One is taking a short trip about town. The others will not return for a week. The eighth class left yesterday for a ten-day trip down the Rhine and into the Black Forest. The fifth class is beginning its second week on an island in the Baltic."[1] The older pupils are also freed from class attendance one day a month in order to spend time in reading, thesis writing or independent study. Scientific methods of research are introduced in the secondary schools, and examinations are often based on research ability as well as knowledge of subject matter.

The textbook often contains only a brief outline of the ground to be covered. The teacher usually presents new material directly, in an uninterrupted lecture, from which the pupils make notes: they are held accountable for this the following day, in a careful oral examination, lasting about half the class time. This review includes not only the recent material, but may refer to any previous instruction, and to related matter in other fields.

Much could be learned from the plan of teaching in many English schools. A description of one master's method of teaching geography in a preparatory school gives these details: "He draws from memory, and questions entirely without a textbook, constructing his

[1] Alexander and Parker: "Education in the German Republic." N.Y. 1929. p. 282.

outline and filling in details before the class." A coherent course in map study is part of the training which is offered to all pupils above the primary level. The ordinance map of the local district is explained and used when the children are about eleven years old.

TEXTBOOKS, ATLASES, AND MAPS

Wall maps and atlases of high quality, provided at a low selling price because of quantity production, are a response to a demand from almost every school room in Western Europe. Maps published by the government are also available in most countries, and are commonly used in the schools. The elementary textbooks in geography, with a few exceptions, are very brief, with slight space given to descriptive material or to maps, as compared with textbooks used on the same grade level in the United States but they are probably adequate for the purpose for which they are employed.

WHAT WE CAN LEARN FROM EUROPE

It is not the purpose of this investigation to render judgment as to the relative merits of the various phases of geographic study found in European countries. We shall not attempt to judge some to be superior in all respects to others. Nor is there any disposition to assert that the details of instruction which have won high favor in European education should be incorporated bodily into our schools. Full cognizance must be taken of local problems, and of the diverse conditions which prevail in the different sections of the United States. If, however, the findings of such a study throw some light on the real working of the programs of school geography in European countries, where older civilizations have long been dealing with this difficult educational problem, we may come indirectly to a clearer understanding of our own treatment of those subjects which have to do with man and his environment.

Educational literature generally indicates that the student who has passed thru a European school system has a greater fund of essential geographical lore than one who has spent the same number of years in an American school. It is also said that the child trained in our schools lacks accuracy and precision of knowledge, that he is likely to fail in abstract thinking, and that he is limited largely to specific and concrete things.

In accounting for this difference we may attribute it, as far as geography is concerned, to the large place which the subject holds

in the education and life of most European peoples. Without doubt, a European background has been more conducive to the study of geography than has our own. Every European nation finds it necessary to study its neighbor nations in order to understand its own close relations to them. Dependence on foreign trade gives to many states a point of view regarding other parts of the world quite distinct from that of more self-contained countries, such as the United States. Ownership of and responsibility for overseas colonies leads to more than a casual interest in the study of typical natural regions beyond the boundaries of the homeland. The wealth of tradition and human culture which has developed about almost every locality in Europe lends significance and variety to local regional studies.

Other reasons for the emphasis now given to geography as a school subject are: the strong position which it holds in European universities, the many trained geographers furnished each year for the schools; the abundance of maps and atlases; the general acceptance of the regional treatment; the voice of great leaders, instructing and inspiring teachers to improve geography instruction in the lower schools.

In contrast, we turn to our own country with its continental area; its land borders touching foreign districts that are but sparsely peopled; its traditional isolationist point of view; its many unmapped spaces; its comparatively few universities and colleges having departments of geography; its lack of uniformity and continuity in school programs; its limited number of trained teachers in the elementary schools; its lack of required geography in the high schools. Great leaders in geography are not lacking, but their task of making geographical studies in our new land has been so overwhelming that the educational problem was relegated to second place.

It is in the program of geographical instruction offered in European secondary schools that the difference becomes most apparent. Almost without exception, no pupil taking a college preparatory course in an American high school has had any required training in geography since leaving the grades. The college freshman, with no training in geography since the 6th or 7th grade, takes up the subject in almost complete bewilderment. He has no background of ordered ideas to give it meaning. With but few exceptions, every pupil in a secondary school in any country of Western Europe is required to take several years of continuous, unified training in the subject, usually under a teacher who is a specialist. In the European

secondary school, the pupil has access to accurate and well made maps and atlases, and to a series of textbooks which organize geographical materials on a regional basis. He is subjected to skillful oral teaching, which is accompanied by many illustrative sketches, and characterized by frequent reviews. He is required to reproduce facts concisely organized, to apply principles, and to understand the language of maps. Eventually he gets a training in the geographer's characteristic methods, and comes to have something of his point of view.

Aside from the difference in requirement, the question arises: Could the teacher in the American high school or junior college do for the unselected masses who crowd our schools, what the French, or German, or English school master does for the select few who reach the secondary schools in his country?

To attempt to state definitely just what should be done to improve the quality of learning in our American system of mass education, would be difficult indeed. No one wishes to "screw down a tightly riveted scheme" on our highly decentralized and localized schools. Yet certain of the principles and practices that prevail abroad, are suggestive of ways in which to improve our present conditions. The following seem worthy of consideration.

1. *Improving the Status of Geography in American Schools.* Geography has an assured place in the lowest and highest levels of education in the United States. It is found in almost every year of the elementary school curriculum, and courses are given in nearly every large university and college. The gap appears to be in the secondary schools. High schools should have curricula in geography which give opportunity for the continuity of study such as is found in almost every secondary school of Europe.

Europe thru long years of struggle was able to develop geography into "a rich deep science with a great cultural content." The belief became prevalent that "the nation would lose a very essential and valuable culture if geography were not taught, or if it were taught imperfectly." (Hettner)

2. *A Program of Regional and General Studies for Secondary Schools.* Historians have constructed a school program for their subject by organizing it according to chronology, or nationality, or by some selective phase as political or economic. Geographers have an analogous plan in the regional method. The division into teaching units may be along physiographic, climatic, economic, or political lines.

3. *Training in the Use of Maps.* More time and care should be spent in the study of maps. Coherent training in mapping and map reading, beginning in the third or fourth school year and continuing thru the grades and into the high school, should be a part of the geography curriculum. Since his training would require the use of many cartographic types, consideration might be given to the "textbook and atlas" plan in the upper grades, as a convenient means of having at hand a variety of good maps for each pupil. The atlas habit ought to be developed early, for an atlas may be used thruout one's school career and after. Kipling's statement "As soon as men begin to talk about anything that matters, someone must go and get an atlas"—proves to be increasingly true in our own land as it has long been in the Old World. Without doubt there would be a demand for better school maps and atlases, comparable to those used in Europe, when a considerable body of people become literate in map language.

In connection with map work, our schools should make much greater use of the topographic maps of the United States Geological Survey. "Topography should no more be omitted in geography than the multiplication tables in arithmetic," states an English course of study. No child should leave school without being able to use the topographic map of his own district, and to visualize with considerable detail the area which it represents.

4. *Emphasizing Local Geography.* Most schools in our country offer some form of local geography as an introduction to the more formal study of the subject. Local geography has a meagre place comparatively, in American schools. It is usually confined to the primary grades, and even there, the tendency to an overdose of "children of other lands" prevents much first-hand study of the locality. One of our major problems is to enrich the intellectual content of local studies. We are not equipped with a literature of local geography, either in maps, atlases, or textbooks. There is nothing in this country to compare with the county geographies of England, or with the Heimatkunde textbooks so well known in Germany and Switzerland. Only two counties of the United States, Los Angeles County in California, and Cook County in Illinois, have carefully prepared recent culture maps of their areas. A few cities, Baltimore, Cincinnati, Binghamton (New York), also have large scale cultural maps of their areas.

The preparation of local maps and atlases, and the gathering of materials on local geography, history, art, literature, and indus-

try should be encouraged by associations of geographers. In areas where settlements have existed longer and where historic and traditional culture has developed, these studies may be full of variety and charm. This has been exemplified in the "New York Walk Book," one of the most delightful guides to the out-of-doors that can be found anywhere.

With a greater background of knowledge about the local area, out-of-doors lessons and excursions may be organized more frequently. Then we can turn to Germany for hints as to a revival of interest in walking and cycling. Poland, England, and Sweden, as well as Switzerland, Germany, and Italy, will share with us their experiences in organizing hostels, in arranging for rates for group excursions, in interesting the school world in the countryside. But until the locality is well mapped, the literature available, the teacher trained, such excursions may come to have little but recreational value.

5. *Changes in Teaching Methods.* In any science where there are principles to be understood and applied, effective teaching is in large part by the "telling method," that is, there must be oral exposition by the teacher, associated with active auditory attention by the pupil together with application of the principles to given situations. To secure this end, obviously the teacher must be such a master of the subject that he is able to add much to the material of the text, and to organize it in a way adapted to the needs of the class.

Surely if Europe has taught us anything, it is primarily this, that we need less dependence on the textbook, more oral teaching, skilled reviews, sketches to illumine difficult points, quick summaries, the use of illustrations gleaned from the locality, unyielding standards of accuracy and precision, and finally, testing for understanding rather than for memoriter performance, if we are to put new life into our geography classrooms.

With regard to examinations, we should probably hesitate long before concluding to saddle upon our schools the English system in its entirety. Yet we are coming to see decided advantages in many forms of the comprehensive examination for our higher schools, and even for the secondary level. The character of the questions or topics set for these examinations in England and France is worthy of our consideration. Geography teaching is not doling out bits and pieces, it is synthesizing them, composing them into a whole, just

as Vidal de la Blache advocated in France, Herbertson in England, and Hettner in Germany.

European teachers of geography have also shown us that much real teaching can be done with but one or two class periods a week if the course is continuous for a period of years. Sustained interest in the subject comes thru long, continuous, course work in which idea is added to idea, skill added to skill, until the student gains the consciousness of excellence. Again, we attribute such results to the teacher's superior knowledge of subject matter, and to his method of oral instruction, as well as to the well planned curriculum.

In our search for the best measures to use in preparing our youth for collective living, we seem to have overlooked, or at least failed to understand an instrument of training which our European neighbors prize highly. It might be worth our while to re-estimate the values in geography as a secondary school offering. If, on examination it should appear to have a form of explanation which no other subject conveys, and which can supplement the social studies in interpreting modern life, a place should be made for it in the curriculum. This does not mean to say that we should transfer bodily to our shores a European program of geography teaching. Rather we should develop programs of our own, related to our national background, and adapted to our material and spiritual heritage. For many of their details, however, these programs would acknowledge indebtedness to older lands; a careful study of the locality, to bring to the child an explanation of the culture within which he lives; a teaching plan somewhat independent of textbooks, and one which is founded upon the regional concept; extensive use of the best forms of cartographic representation; a wise correlation with materials from other fields of knowledge; and finally, a purpose to make the subject point the way toward securing not only national aims but international co-operation.

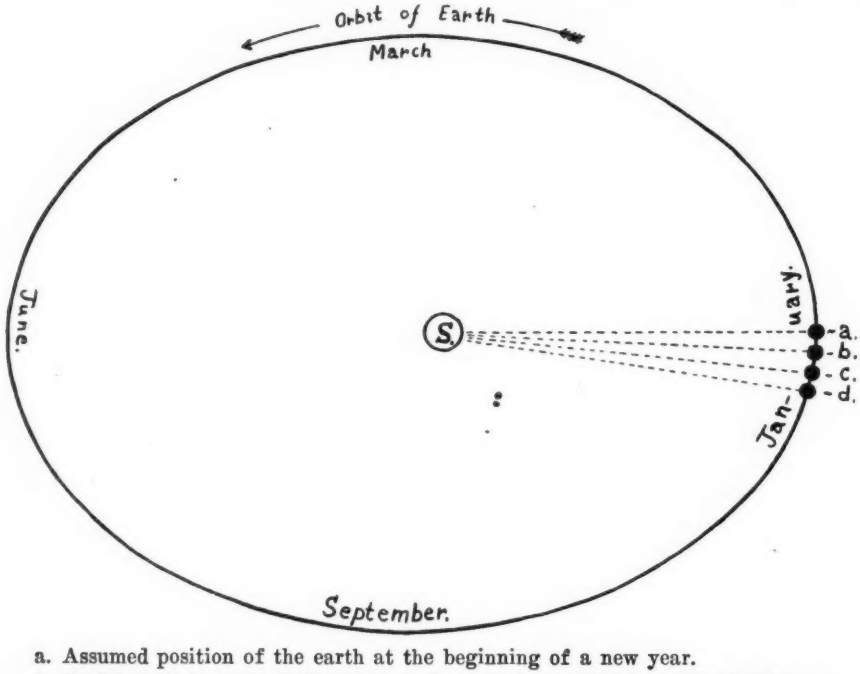
WHY WE HAVE LEAP YEAR

SAM T. BRATTON
University of Missouri

Students generally are familiar with the fact that leap year comes every four years but perhaps do not quite clearly understand just why the extra day is added.

The extra day is necessary in order to keep out calendar time fairly closely in accord with the position of the earth in its orbit. If this relation were not maintained it would not be a great many years until the calendar and the earth's position in its orbit would be so far out of adjustment that our winters (northern hemisphere) would come in July.

We consider a *day* to be the time of one rotation of the earth with reference to the sun. During one journey of the earth around the sun the earth so rotates 364¼ times, nearly, but we count only 365 times, or days, normally for a year. Hence we start a new calen-



a. Assumed position of the earth at the beginning of a new year.
b. Position of the earth in its orbit at the end of one calendar year of 365 days.
c., d. Positions of the earth at ends of 2nd and 3rd calendar years.
The fourth year is given the extra day so that the earth may get back to the original position.

dar year about six hours before the earth has arrived at the point in its orbit from which it started at the beginning of the first year (Fig.). This method of counting puts the earth about six hours behind the position in its orbit it is supposed to reach at the end of the "year." By the time we have counted four 365-day years the earths needs about another day to complete its journey around the sun. In order to give the earth time to complete this journey we put another day in the fourth year and count it in the calendar as February 29.[1] Thus on March 1 the earth's position in its orbit and the calendar time virtually agree once more. Not quite, however, as another correction is necessary every 400 years. The further adjustment requires that only the century years which are exactly divisible by 400 shall be leap years.

[1] There is no particular reason why the extra day should be given to February. It has been so done since the adjustment of the calendar by Julius Caesar, but at first was counted as the second 23rd day of this month. Later it became the 29th.

THE NATIONAL COUNCIL MEETING OF 1934

WILLIAM J. BERRY, Secretary

The Philadelphia meeting of the National Council of Geography Teachers was in every respect in keeping with the excellent quality of former meetings. The attendance was relatively large, tho perhaps not a record-breaker. Owing to the enforced overlap with the Association of American Geographers the attendance at some of the sessions was reduced, yet for the same reason other sessions were especially well-attended because of the opportunity offered Association members to attend sessions of the Council.

An outstanding and recognizedly excellent feature of the meeting lay in the fact that certain of the themes started last year, and at least one from the Washington meeting, were expanded and further developed. This was true particularly of the studies dealing with field geography, so splendidly presented at Evanston by Dr. Dudley Stamp, and with urban geography.

The first session, dealing with field work and planning was opened by Earl Hanson of the Water Resources Section of National Resources Board. Mr. Hanson, an engineer, was the logical person to present the key note of the session, namely, utility of geographic work. He contended that geographers were especially well qualified in regional planning because their training helped them to see not only the basic physical facts but also possibilities in utilizing the physical environment toward the end of greatest human good.

Dr. Ridgley's paper, read by Harrison Russell, advocated greatly increased use of local environment by elementary classes in order that children may get concrete geographic concepts. It further pointed out what concepts could be gotten at the different grade levels. The carefully prepared paper of L. C. Davis, stressing techniques employed in field work by students of adult level, might well be used as a model in work of that type. Floyd Cunningham's review of papers on field work given at the Warsaw Geographical Congress led us to believe that, in many respects, continental geographers were at least not ahead of us in field activities. Rayburn W. Johnson, using Tennessee as a case, presented techniques in state study that should work out satisfactorily in nearly any state. Miss Elliott ably summarized the discussions of the morning by re-emphasizing the outstanding points of the

earlier papers and by showing the importance of doing more work not only with actual landscapes but also with pictures.

The session of Wednesday afternoon might be called the miscellaneous session. While recognizing the contribution of each and every one of the papers, space permits the writer to call attention only to Harriet Carter's method in the presentation of much material in a very short time, Russell L. Packard's emphasis on the geographer's opportunity in the sadly neglected field of high school geography and Robert M. Brown's stimulating discussion of a non-regional approach to political geography. The splendid response from the floor during the forum, so ably led by Miss Grassmuck, seemed to point to the desirability of more opportunities in our meetings for voluntary discussion.

The session of Wednesday evening continued the opening theme of the meeting, with G. Donald Hudson discussing "Geography and Regional Planning," using as the basis for his discussion the interesting work that he, together with a corps of other trained geographers, is doing in land planning and housing in the Tennessee Valley. Again there was lively response from the floor and only the necessity for continuing the program brought the discussion to a close. A roll call by states conducted by Josephine Moyer, President of the Pennsylvania State Council, and an informal reception concluded the activities of the day.

The session of Thursday morning, using urban geography as its central theme proved to be exceptionally interesting. As Miss Aitchison, who led the summary discussion, expressed it, "The unity of the combined papers would lead one to suppose that the six contributors must have worked out the program together." Preston James, of Michigan, dealt largely with site in connection with Rio de Janeiro and Sao Paulo; Samuel Emory of North Carolina dealt chiefly with the situation of Greensboro; Olive Thomas, of Wisconsin, stressed pattern and its interpretation in Green Bay; Lewis Thomas of St. Louis, emphasized changing adjustments in that city; Mary Lanier, of Massachusetts, rounded out the urban studies by dealing with pattern, situation, site and changing adjustments as applied to seventeenth century Boston; and Ruby Harris, of Illinois, professionalized the discussion with her presentation of "Organizing Urban Material for Classroom Use." It is remarkable indeed that persons so widely scattered and using cities so widely distributed in time and space would in working independently present so unified a program.

The outstanding paper of the afternoon session, and perhaps of the conference, was presented by Dr. William Scott Gray of the University of Chicago. In a sense he re-emphasized what Dr. Horn told us in Chicago about the desirability of teachers of geography being trained by geography departments rather than by departments of education. Dr. Gray went into detail on the working of the plan as it is being carried out at the University of Chicago and the good results they seem to be getting.

The theme of teacher training was continued with papers by George F. Howe, L. A. Packard, W. M. Gregory, Lucy L. Wilson and Pearle Blood.

The session was closed with a discussion by George J. Miller, who was turned loose with the topic, "What More Can We Do?" Those of us who had prepared to sit back complacently with the thought that we had done almost everything were soon shown that we had done almost nothing yet. He pointed out a multitude of activities that not only could be done, but which should command our immediate attention. The applause that he received must have made him wonder whether the listeners were glad that he was thru with his list of new duties or whether he was receiving unanimous and enthusiastic pledges of activity.

The National Council was fortunate indeed in having as its speaker at the Annual Dinner Dr. Isaiah Bowman of the American Geographical Society. Dr. Bowman is so well known that comment upon him at this time would hardly seem in place. Needless to say, his address will be remembered for its interest and inspiration as one of the most excellent of all time.

At the Annual Dinner the Distinguished Service Award was presented to Dr. Almon E. Parkins, George Peabody College for Teachers, in recognition of his long service and constructive contributions in the field of geographic education. The presentation was made by President Edith P. Parker.

BUSINESS MEETING

BOARD OF DIRECTORS AND EXECUTIVE COMMITTEE

The annual business meeting of the Board of Directors and Executive Committee of the National Council of Geography Teachers was held on the Mezzanine Floor of Hotel Pennsylvania in Philadelphia on December 27, 1934. The following business was transacted:

1. Meeting called to order by President Edith P. Parker.
2. The report of the Nominating Committee, consisting of Lucia Harrison (chairman), Robert M. Brown and George J. Miller was presented by Mr. Brown and the following persons were elected:

President: Clyde E. Cooper, Ohio University, Athens, Ohio
First Vice-President: Alison E. Aitchison, Iowa State Teachers College, Cedar Falls, Iowa
Second Vice-President: Floyd F. Cunningham, State Teachers College, Florence, Alabama
Secretary: William J. Berry, Western State Teachers College, Kalamazoo, Michigan
Treasurer: H. Harrison Russell, State Teachers College, Bloomsburg, Pennsylvania
Executive Committee (term to expire in 1937): A. E. Parkins, Peabody College, Nashville, Tennessee; D. C. Ridgley, Clark University, Worcester, Massachusetts; Edith P. Parker, University of Chicago, Chicago, Illinois
Directors at Large (one year only): W. T. Chambers, State Teachers College, Nacogdoches, Texas; O. W. Freeman, State Teachers College, Cheney, Washington; Erna Grassmuck, State Teachers College, Indiana, Pennsylvania; R. B. Hall, University of Michigan, Ann Arbor, Michigan; Margaret Means, Bloomington High School, Bloomington, Illinois; Clare Symonds, Senior High School, Quincy, Illinois; Elizabeth D. Zachari, Louisville Normal School, Louisville, Kentucky
Distinguished Service Award Committee (term to expire in 1939): Marguerite Uttley, Iowa State Teachers College, Cedar Falls, Iowa

3. It was moved and seconded that the secretary be empowered to appoint members to the Board of Directors from states not having a representative on the Board. Carried.
4. Miss Alice Foster gave the report of the Committee on Political Geography. The report was approved, and the Committee was instructed to continue its excellent work and, if possible, report by letter to the members of the Board and Executive Committee.
5. Mr. R. M. Brown presented the report of the Research-Finance Committee. The report was approved. In this connection a letter was read from McKnight and McKnight, to the effect that royalties from the sale of Volume I, Geographic Education Series, has amounted to $139.00, and a check for that amount was enclosed.
6. Miss Zoe Thralls presented the report of the Committee on New Research in Geography. The report was approved and the Committee was instructed to continue its work.
7. Mr. George W. Howe gave a report on Press Bulletins. His report was approved and the Board requested that his activities in Press Bulletins be continued.
8. The following letter to the Board of Directors from George J. Miller, editor of the JOURNAL OF GEOGRAPHY, was read:

December 23, 1934

To Board of Directors
National Council of Geography Teachers:

It is with pleasure that I present at this time Volume II of the Geographic Education Series and which will be ready for distribution about February 1. Unfortunately it could not be made ready in time for display at this meeting.

The new volume is entitled, "Human Geography Studies: United States." It consists of selected articles dealing primarily with unit areas well distributed thruout the country. The richness and variety of treatment in these various articles should be of real and practical assistance to teachers.

The personal expense in connection with Volume I was $9.60. The expense in connection with Volume II, has not yet been determined.

Very sincerely yours,

GEORGE J. MILLER
Editor

The second volume was accepted most enthusiastically and Mr. Miller was commended for his excellent work.

9. Miss Erna Grassmuck reported on the activities of "American School of the Air" and requested the assistance of those present in carrying the work further. The individual members pledged their assistance and support.
10. At President-elect Cooper's request the dates for the St. Louis meeting were informally discussed.
11. Mr. Howe called attention to the fact that he, and probably others, had been receiving an unnecessarily-large quantity of Council stationery. It was therefore moved, seconded and carried that the paper be sent out only to such officers of the council who need and request it.
12. The following report of the Committee on Resolutions was presented and approved:

1. *Resolved,* That the National Council of Geography Teachers express to the University of Pennsylvania sincere appreciation of its courtesy in extending the use of its facilities during the meeting of 1934.

2. *Resolved,* That James F. Bogardus, Frank E. Williams, Erna Grassmuck and all others of the local committee be commended for their splendid efforts in providing for the needs of the session.

3. *Resolved,* That the Council is very grateful to Dr. Isaiah Bowman for his inspiring address at the annual dinner.

4. *Resolved,* That the Council is doubly indebted to Professor George J. Miller for his efforts in preparing Volumes I and II of the Geographic Education Series, and for the splendid quality of its official organ, JOURNAL OF GEOGRAPHY.

5. *Resolved,* That the Board of Directors and the Executive Committee express their appreciation to A. J. Nystrom and Company for the complimentary dinner.

6. *Resolved,* That the Council extend a vote of thanks to the Geographic Society of Philadelphia for its hospitality on Thursday afternoon.

7. *Resolved,* That a vote of thanks be extended to the guest speakers for their part in making the Philadelphia meeting a success.

8. *Resolved,* That the members of the Council express their appreciation to the Columbia Broadcasting Company for its excellent geography broadcasts.

ZOE A. THRALLS
MARGUERITE UTTLEY
ALICE FOSTER
HARRIET CARTER

The following persons were present at the business meeting:

Edith P. Parker
C. E. Cooper
Ella Huntting
H. Harrison Russell
William J. Berry
Alice Foster
Almon E. Parkins
Alison Aitchison
George J. Miller
R. M. Brown
Floyd F. Cunningham
Erna Grassmuck
Elizabeth Gregory
George F. Howe
Earl E. Lackey
L. O. Packard
Carrie H. Shipley
DeForest Stull
Zoe A. Thralls
Marguerite Uttley
Elizabeth Zachari

NATIONAL COUNCIL MEETING, 1935

The annual meeting of the National Council of Geography Teachers for 1935 will be held in St. Louis on December 27 and 28, associated with the Association of American Geographers and the American Association for the Advancement of Science.

This plan offers a full week of unusual opportunities to hear of the latest developments in geography and in related sciences.

The central location of St. Louis should result in well attended meetings. Begin to plan now to meet your fellow workers in geography next December.

Suggestions as to topics to be discussed and offerings of papers will be gratefully received and carefully considered.

CLYDE EDWARDS COOPER, *President*

Ohio University
Athens, Ohio

EDITORIAL NOTES AND NEWS

The longest vehicular tunnel in the world, the Queensway, was opened last year between Liverpool and Birkenhead. Recently construction was begun in New York City off West 39th Street on a tunnel under the Hudson paralleling the present Holland Tunnel.

A new record for North Atlantic steamship crossing was made last November by the Bremen, the North German Lloyd liner, which went from Cherbourg to Ambrose Light off New York in 4 days, 14 hours, and 27 minutes. The speed of the new Cunard-White Star liner, Queen Mary, is expected to exceed thirty knots an hour.

The new 200-inch telescope, the glass mirror of which was poured at Corning, N.Y., will be mounted on Palomar Mountain (elevation 6,126 feet), 45 miles northeast of San Diego.

A record for deep-sea diving was made on August 15 by Dr. William Beebe and Otis Barton when their bathysphere reached a depth of 3,028 feet.

The 1935 meeting of the World Federation of Education Associations will be held August 10-17 in Oxford, England. Those interested should communicate with the headquarters office, 1201 Sixteenth Street, Washington, D.C.

More and more opportunity for travel is being afforded the youth of Europe. Already there are more than 3000 hostels thruout Europe open to members of the Youth Hostels Associations, according to a report from the third International Conference of the Association held in London in October. Not only is travel in vacations and within the home country encouraged but travel extended to foreign lands is getting a place in the regular curriculum. Thus last August a group of school boys left London on a visit to East Africa until December, under the organization of the School Empire-Tour Com-

mittee. Another group from the Isle of Wight was given a ten days' cruise to Morocco and Spain in September. Also, last summer 125 German boys and girls spent July in England and were accompanied home by 70 English boys and girls for August. The value of these exchanges is inestimable.

A descriptive price-list of maps published by the Mississippi River Commission is available from the president's office, Vicksburg, Mississippi. They are listed in eleven sets, each depicting some natural features of the river and the topography of the valley together with such cultural features as levees, plantations, landings, seaplane anchorages, the land transportation pattern, and flood control projects.

The Geography Section of the New York Society for the Experimental Study of Education joined in its regular January meeting with a conference group from Teachers College, Columbia University, in a joint discussion on the theme, "The Contributions of Geography to the Understanding of Modern Life." Almost five hundred were in attendance. DeForest Stull of Teachers College reported the Philadelphia Meeting of the National Council and had charge of the program. David J. Swartz is the Chairman of the Geography Section.

Phenomenal progress in the development of speed has been made the past year by the railroads. The new streamlined Union Pacific M10001 ran from Los Angeles to New York City in 56 hours and 55 minutes. Similar speeds will soon be regularly available on full length trains in a four hour run between New York and Washington. The Northwestern has inaugurated a mile a minute passenger service between Chicago and Minneapolis, while a regular Milwaukee steam train has demonstrated its ability to average 90 miles an hour on a recent run between Chicago and Milwaukee. This speed, together with the increased comfort thru air conditioning, is the railroads' answer to the challenge of the fast airplane, motor bus and automobile services.

Have you a hobby? The U. S. Weather Bureau officials would like to interest you in the weather as an attractive field for observations or investigations. You may become interested in recording daily weather data or in relating various weather phenomena to transportation, to recreation, to crops, to industry in general. Some of these effects you may care to photograph. If you wish, the Bureau will be glad to have a share in your findings. Perhaps your students, too, will enjoy such a hobby.

If you are interested in films depicting what the Civilian Conservation Corps is doing to control erosion and to further forestation or in films showing the life of the beaver, the elk, and the porcupine, write to the office of Motion Pictures, U. S. Department of Agriculture, Washington, D.C. There are no other costs than those of transportation.

For several years the Department of Agriculture has been seeking data on the distances traveled by pathological organisms causing plant diseases, such as wheat rust. Valuable collections of several air-borne organisms were made by Colonel Lindbergh in his Arctic flight in the summer of 1933. His data are the first showing the distribution by air currents of fungi in northern lands.

More than a thousand sportsmen from ten states participated in the 1934 controlled deer hunt in the Kaibab National Forest. About seven out of every eight hunters shot a deer. The number killed served to reduce the herd to the carrying capacity of the

forest pasture range. The economic value of the hunt amounted to more than forty thousand dollars, the guide services, lodging, meals, transportation costs, and licenses being the greatest items of expenditure.

The England to Australia air race of 1934 was won by Black and Scott, British pilots, who covered the 11,325 miles in 71 hours. Another outstanding achievement is the solo flight of Amelia Earhart who flew 2408 miles from Honolulu to Oakland in 18 hours, 16 minutes. In commercial aviation mention should be made of the flying service of Pan-American Airways between Florida and Buenos Aires in less than four days' flying time.

According to the Department of the Interior, Alaskan mines in 1934 had an output estimated at more than sixteen million dollars. Since 1880 the total output is valued at more than $680,000,000.

In a recent release from the press service of the U. S. Department of Agriculture, J. B. Kincer of the Weather Bureau states that expansion of the cultivated area in the Great Plains area and the drainage of surface waters should not be blamed for last summer's drought. Rather does it appear that cool polar air masses failed to move south until the middle of August. Then the comparatively warm and light tropical air moved up over the opposing dense polar air mass bringing drought-relieving showers to the interior states. Increased analyses of these air mass movements are being furthered by study of records obtained by the release of balloons carrying self-recording weather instruments.

AN INTEREST-STIMULATING DEVICE

Geographical Jig-Saw Puzzles

An excellent correlation device that can be used to link the composition and geography work is the use of Geographical Jig-Saw Puzzles. During geography or English time the pupils are allowed to write stories, descriptive paragraphs, riddles, poems, or jingles pertaining to phases studied in geography. These copies, written in pencil, are handed to the teacher and when they are accepted by her, the pupil rewrites his contribution in ink. The ink copy is then pasted or glued onto oak tag or a thin piece of cardboard, that can be cut out after it is dry with scissors or a sharp knife. The pupil cuts the oak tag in many pieces corresponding to a jig-saw puzzle. The pieces are put into an envelope and are taken home by some pupil other than the author. When he puts them together, he reads a geographical story that is of distinct value to him. A good incentive is given him to write one that will be acceptable so one of his classmates will take his jig-saw home to read.

Teachers will find that they are "swamped under" with stories to check. They will certainly not be bothered with the usual procedure of driving pupils to write some story for English that has no phase of motivation behind it.

RALPH S. HARRIS, *Principal*

Lincoln School,
Wood River, Illinois

NOTE

Send descriptions of your interest-stimulating devices to the JOURNAL. We will be pleased to pass them on as an aid to others, thru the pages of the JOURNAL. There must be hundreds of teachers who have worked out these aids in teaching. Make your description brief, clear, and exact so that another teacher may follow your directions.

EDITOR

Ellsworth Huntington and Sumner W. Cushing. **Principles of Human Geography.** 467 pp. Illustrated. Fourth Edition. John Wiley and Sons, New York.

This well known book, Principles of Human Geography, has been revised and enlarged in a Fourth Edition by the addition of some 44 pages and 15 figures, plus index. The number of references has been increased about fifty per cent and the statistical data have been brought up to date. The chapter on "The World's Diet" has been omitted. Some of the notable changes in the text material are: Part II, "Man's Relation to the Earth as a Globe," the discussion of maps and map making is enlarged and the concepts of triangulation and contour maps are presented. Part III, "Man's Relation to Land Forms," has been enlarged by 15 pages, nearly all of which are devoted to the topic, "The Continents and Man" which has been entirely rewritten and much improved. In Part V, "Man's Relation to Soil and Minerals," the topic of soils is discussed from the viewpoint of young, mature, and old soils. The part which climate and vegetation play in soil development, a new viewpoint which has not yet become general in textbook material, is presented. In the back of the book is a map by Louis Wolfanger presenting the soil regions of the world under this new classification. This discussion of soils is a most worthy addition to the text. The change of heading of Part VII from, "Man's Relation to Vegetation" to "Man's Regional Relationships" suggests the wider viewpoint with which this section is discussed. Part VIII, "Man's Relation to Man," has been enlarged by a fuller discussion of some of the current problems of political geography, particularly in the discussion of Russia.

Especially to be commended is the improved form of designating the organization of topics thruout the text. Main topics are given in a heavy faced type while the subtopics are indicated by italics, a thing notably lacking in former editions. The reference to all figures by a page number and a letter is an aid in finding quickly the reference given. Many of the maps have been improved in clearness of detail and by the substitution of Semi-Homolosine Equal Area and Semi-Eliptical projections for the Mercator Projection maps.

Few adverse criticisms are to be made. Here and there are statements that lack scientific accuracy and should be improved. For example on page 350 it says, "If the sun stood always at its most southerly position . . . ," the first phrase is repeated in the same paragraph—when only the position of the vertical ray of the sun is intended. Again in Fig. A244, a vertical section of the wind system, high and low pressure areas are represented as being in the upper stratas of the atmosphere instead of near the surface of the land.

The authors are to be commended for this enlarged and much improved Fourth Edition. It will undoubtedly be accorded a hearty reception by teachers in high school and junior college.

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